

FINAL REPORT

Sustainability Assessment of a Military Installation

A Template for Developing a Mission Sustainability Framework, Goals,
Metrics and Reporting System

AUGUST 2009

ATKISSON

AtKisson Inc.

Authors:
Alan AtKisson
David Berry
Lee Hatcher

Editors:
Samuel Figuli
John Rupnik
Bradley Smith

*This document is approved for public release;
distribution unlimited.*



Strategic Environmental Research and
Development Program

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE AUG 2009		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Sustainability Assessment of a Military Installation: Design for a System of Reporting				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AtKisson Inc.				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 77	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

This page left blank intentionally

Acknowledgements

The consulting team responsible for leading this project would like to take this opportunity to thank the personnel at SERDP, HydroGeoLogic, Inc., and NBVC for their highly engaged partnership in the development of this MSF and metrics road map. This was a truly a large team effort. All share a commitment to the success of the initiative and stand ready to assist in the future.

Contact Information

Alan AtKisson, President
Alan.AtKisson@AtKisson.com
+46 709 926 979

David Berry, Senior Associate
David@AtKisson.com
+1 703 741 0791

Lee Hatcher, Senior Associate
Lee@AtKisson.com
+1 206 423 1299

Samuel Figuli
SERDP/ESTCP Support
HGL, Inc.
SFiguli@hgl.com
703-696-8551

John Rupnik
SERDP/ESTCP Support
HGL, Inc.
JRupnik@hgl.com
703-736-4576

Bradley Smith
SERDP Executive Director (Ret.)
bpsmith@gmail.com

This document was prepared by AtKisson Inc. in collaboration with HydroGeoLogic, Inc. under contract #FA8903-08-D-8772.

Contents

Contents.....	4
Executive Summary	5
Background: Why Sustainability Metrics?	6
Scope of this Report.....	6
Other Relevant Initiatives	7
Methodology.....	7
Mission Sustainability Framework.....	9
Issues and Elements.....	11
Conceptual Metrics	13
Design for the MSF Reporting Template.....	18
Summary and Recommendations.....	27
APPENDIX A: Complete List of Issues and Elements	29
APPENDIX B: Descriptive Details on Telephone Survey Results.....	37
Executive Summary - Excerpts	37
APPENDIX C: Candidate Metrics - Complete List	39

Executive Summary

The sustainable management of U.S. military bases is a matter of increasing priority. Effective management of all the relevant aspects of long-term stability, reliability, and resilience of operations requires a comprehensive framework as well as appropriate management metrics and reporting systems to highlight emerging issues and systemic problems. The primacy of the mission to the U.S. military, together with the complexity of base operations and their relationships with the surrounding environment and community, means that simple adaptation of existing sustainability metrics and management frameworks would not produce an adequate set of tools. A tailored approach is required.

To fill this gap, the Strategic Environmental Research and Development Program (SERDP) engaged AtKisson, Inc., working in collaboration with contractors and military personnel, to develop a suitable Mission Sustainability Framework (MSF) and set of sustainability metrics that could be adapted to virtually any military installation across the United States. Naval Base Ventura County (NBVC) in southern California was selected as the prototype and reference location for the research and development (R&D) process.

Highly representative of U.S. military bases in general, NBVC consists of 73 commands, in two separate locations (Pt. Mugu and Port Hueneme) housed in 1,500 buildings. NBVC exists to fulfill three main functions: training, mobilization, and testing. NBVC operates an airfield as well as a seaport. It has base housing and deploying units. It also serves many commands not directly associated with these three functions. This diversity of functions ensured that the MSF and metrics would be robust across different types of military bases.

This report consolidates and presents the key results of this project, including (1) the MSF for categorizing and presenting metrics, (2) the Issues and Elements of management and measurement interest, (3) Conceptual Examples of sustainability metrics in each MSF category, and (4) a Conceptual Design Sketch for a sustainability reporting system, which can be further developed to work in harmony with other metric reporting systems now in use or development.

The process of developing these project elements included extensive interactions with key personnel at NBVC from a variety of different commands, in forms ranging from a workshop to document review to individual interviews. This input was critical in the development of the MSF as well as identification of the Issues and Elements and Conceptual Metrics.

A framework on which to build a comprehensive sustainability metrics system for U.S. military installations is the culmination of this project. Next steps in that process, described in this report, include: (1) moving beyond the Conceptual Metrics to define specific sustainability metrics for each of the Issues and Elements based on available data; (2) validating and adjusting those metrics through a data assessment process and in dialogue with expected end-users; and (3) constructing an actual sustainability reporting system (document and eventually digital versions), using all available and relevant data, for trial use in real-time base sustainability management.

Sustainability Assessment of a Military Installation: Design for a System of Reporting

This report presents the results of an R&D effort sponsored by SERDP to create a sustainability reporting framework and template with metrics for U.S. military bases.

Background: Why Sustainability Metrics?

The U.S. Armed Forces excel at a vast diversity of missions and have long used sophisticated systems of measurement and analysis to determine the degree to which the objectives of those missions are being met. In real time, commanders at all levels receive relevant information on what is happening and what is needed to meet the objectives for which they are responsible. However, neither the United States as a whole nor the Department of Defense (DoD) now use standardized, highly visible, and regularly observed indicators of the condition and trends related to the sustainability of critical natural resource, environmental, and social factors. In the case of the United States, these factors affect the security and wellbeing of the nation. In the case of DoD, these factors are now commonly understood to affect readiness. And yet there are no indicators on those topics with the efficacy and visibility needed.

Environmental and resource factors are becoming more and more obvious in their impact on mission readiness, but social factors are also critical. In developing a framework for sustainability metrics for military bases, the importance of including social factors in that framework became apparent. For example, a major factor in the decision for those members of the U.S. Armed Forces who choose not to reenlist at the end of their term of duty is dissatisfaction of the spouse with the quality of life of the family. A systems view used in the study of sustainability calls attention to the fact that all of our economic, military, environmental, and social activities and objectives are interrelated.

It is the view of the DoD team and consultants involved in this project that if commanders have in front of them measurement tools that give them timely feedback related to the key elements of sustainability – highlighted in the MSF that was developed in this project – the results would be positive in terms of impact on climate change, resource availability, environment, quality of military life, and on the mission itself.

Scope of this Report

The sustainability metrics system described in this report has undergone extensive review and development, but it should not be considered a final product. This report is intended to form a basis for discussion and review with stakeholders at NBVC as well as in the national network of interested parties in the relevant Services and Agencies. These consultations are expected to result in further adaptations of the reporting system. This report is also intended to guide the process of creating a prototype and filling in actual data from a military installation and is expected to result in further refinements to the general template.

The “Summary and Recommendations” section presents the additional steps to be pursued to convert the MSF and metrics template into a fully functioning, highly relevant, and well-used metrics system to support military base sustainability and management.

Other Relevant Initiatives

The MSF reporting template presented here is a work in progress that needs to be in dialogue with other similar or relevant initiatives that have emerged in other branches of the U.S. Armed Forces and elsewhere. An important development over the past two years, concurrent with this project, is the emergence of several other programs with relevance to sustainability metrics and reporting on a military installation. This report also attempts to harmonize with, or at least make appropriate reference to, those similar initiatives wherever appropriate, particularly the suggested metrics of the Defense Readiness Reporting System for the Navy (DRRS-N).

DRRS-N is a comprehensive data and reporting tool to support mission and installation management. It covers numerous issues that are similar to the MSF but is not organized around the concept of sustainability; many issues critical to longer-term sustainability and resilience of commands are not included. The DRRS-N uses a 100-point scaling system for performance reporting that is similar to the one recommended in this project; for this reason, streaming relevant MSF data into the DRRS-N seems a good possibility. Alternatively, the MSF could be designed as a supplementary management system focused on longer-term issues, to complement the near- and mid-term focus of the DRRS-N. As a first step in that direction, the Mission metrics included in this report are drawn entirely from the DRRS-N system.

Methodology

The following sequence of events was followed to develop the sustainability metrics – the foundation of the reporting system:

- (1) Define **Sustainability** for a military installation
- (2) Develop a **Mission Sustainability Framework** to describe the domains to be assessed
- (3) Discover the key **Issues and Elements** (specific sustainability aspects to be assessed) within each MSF category
- (4) Define proposed **Conceptual Metrics** that reflect the status and trend for each Issue or Element
- (5) **Validate and finalize the metrics** in dialogue with users and stakeholders (this includes limiting the set to a manageable number of measurable metrics, approximately ten per category for a total of 60, and making initial assessments of data availability and quality)
- (6) **Identify available data sources** and make additional adjustments to the metrics set (data acquisition always results in some adjustment of the metrics themselves)
- (7) Develop a conceptual **Sustainability Reporting Template** that can be used as a “dashboard” to monitor that status and trends of the sustainability metrics as a group in each MSF category as well as individually

- (8) **Develop a final report** that highlights important findings, presents the conceptual metrics in a useful and transparent way, and makes recommendations for adaptation to individual military installations.

Installation Sustainability: A Definition

For every military base, facility, fort, port, range, or installation, mission is its driving force—its reason to exist. The success of the mission is ultimately dependent upon the sustainability of that installation.

The sustainability of an installation is defined here as:

Capacity for continuous operations in the long term coupled with resilience for maintaining operations in the case of short-term shocks and disturbances.

This definition assumes a systemic orientation that links a long-term perspective on key factors affecting base mission success with a base's short-term capacity to withstand nonlinear events ("shocks to the system") of various kinds without a serious interruption in core operations. The definition assumes the inclusion of the missions of the various tenant commands on an installation.

In more concrete terms, an installation is considered to be more sustainable when it:

- maintains the supply of services from its resource base without degradation.
- possesses high morale
- maintains mutually beneficial relationships with the surrounding community
- is adaptable to changing needs and situations
- anticipates at least 20 years into the future
- is able to operate self-reliantly in case of emergency

An important aspect in defining installation sustainability is the recognition of system boundaries and carefully determining how far beyond the installation "fence" sustainability metrics are considered and measured. For the purposes of this effort, identifying the significant issues of concern to installation personnel resulted in the inclusion of issues and metrics that extend beyond the installation boundary into the neighboring community and region. The Global Reporting Initiative (GRI) provides useful guidance on definition of boundaries in sustainability reporting: <http://www.globalreporting.org/ReportingFramework/G3Online/SettingReportBoundary>

The following framework for metrics, the MSF, provides an overarching set of categories for structuring sustainability management and metrics for a military installation. Mission is central and primary to the framework, and "mission metrics" include aggregate indices comprised of metrics drawn from other categories in the framework. All other metrics measure the status of critical systems and the performance of activities and facilities that support the mission of the installation. Metrics were developed that can use direct measurement, representative indicators, or proxy data, depending on factors such as availability, cost, and transparency of the available figures.

Other Key Definitions

- **Metrics:** Status and trend data supportive of performance assessment and usually presented in quantitative form.
- **Mission Sustainability Framework (MSF):** The working name for the framework of sustainability metrics being developed by this project.
- **Mission Impacts:** Changes to the capacity to successfully carry out the mission due to external causes or factors. Mission Impacts can be positive or negative, short-term and long-term.
- **Cost Impacts:** Changes to the cost of maintaining operations to meet mission goals due to external causes or factors. Cost Impacts can be positive or negative, short-term and long-term.
- **Readiness:** The relative ability of the base and its tenant commands to fulfill their mission quickly and efficiently. This includes the capacity to continue essential services and operations during a disaster or emergency.
- **Aggregation:** Combining several data streams measured in similar units (or converted to a performance scale) to create one metric.
- **Performance Scaling:** A process of assigning minimums and maximums to data streams in order to transform them into a performance scale (i.e., 0-100, with 100 as best possible performance).
- **Indexing:** Combining a set of themed metrics that are defined as adequately representative of an overall topic, and presenting the resulting “index” as an indicator of overall status and trend for that topic. Indexing is often done by converting the metrics to a common unit expressed in terms of a performance scale and averaging the result.

Mission Sustainability Framework

The Mission Sustainability Framework was developed in consultation with personnel from Naval Base Ventura County and SERDP. It provides a category structure, as well as a foundation for operational and symbolic unity, for the sustainability metric system. The design was informed by general knowledge of sustainability in large system settings and by a more specific review of other military sustainability initiatives in the United States as well as in several other countries (United Kingdom, Sweden, and Australia).

The MSF consists of a set of six metric categories, under which have been grouped a set of proposed metrics relevant to that category. The categories are (1) Mission, (2) Management, (3) Neighbors and Stakeholders, (4) Operations and Maintenance, (5) Environment, and (6) Quality of Life. This summary graphic has served as a “guiding star” throughout the subsequent phases of the project.



1. Mission

The term "Mission" in this context covers overall performance measures related directly to the ability of the base to meet its military mission. This set of metrics depends on additional input from tenant commands and base command in order to identify an optimum set of readiness metrics. Mission holds a central, unifying position in the framework.

2. Installation Management

"Management" is defined here as the performance of the command, administrative, and training activities on the base. This category focuses on evaluating how the base is running as an institution and supporting the various commands.

3. Neighbors and Stakeholders

This category clusters all metrics reflecting the status of important relationships between the base and various stakeholder groups in the local community, such as non-profit organizations, homeowner associations, professional associations, key service providers, and local, regional, and state agencies. Also included in "Neighbors and Stakeholders" are measures of impacts related to the *interaction* between the base and the community.

4. Operations and Maintenance

This category covers metrics that are related to the operation and maintenance of the physical infrastructure of the base. The terms "equipment" and "infrastructure" in this context refer to elements that are in support of tenant commands but not under their direct control.

5. Environment

"Environment" metrics are those related to both environmental impacts and mitigation strategies. This category includes impacts and mitigation strategies for sites off the base insofar as they are *impacted by* the base or have an *impact on* the base.

6. Quality of Life

"Quality of Life" incorporates the well-being and morale of personnel—military and civilian and their families—living both on the base and off.

Issues and Elements

The next step in the process is to define the issues and elements, i.e., the specific aspects of the base, its tenants, operations, and position within the region that impact sustainability. These issues and elements fall within one (or more in some cases) of the categories of the MSF. The process of developing the MSF itself provided an initial set of items that were deemed important to the sustainability of a facility.

To develop the Issues and Elements, NBVC and tenant command personnel were consulted through a process that included: (1) an on-site workshop, (2) a detailed survey, and (3) 28 individual interviews with the command-level personnel who participated in the survey. The interviews yielded a large amount of information about how NBVC operates, the most important Issues and Elements identified by participants, and participant ideas for sustainability metrics. The resulting list of Issues and Elements then became the basis for the development of Conceptual Metrics (the next stage in the process).

The interviews also produced other critically important information on sustainability management and metrics usage at the installation level. Among other things, the interviews revealed that data is currently underutilized in the management of NBVC. This finding presented a new design criteria: The Mission Sustainability Framework and reporting system need to contribute to an increased utilization of metrics *in general*. In addition, the interview discovery process clarified the distinction between general issues that were universal to military installations and specific issues that were relevant only to NBVC, leading to another design criteria: The final Reporting System would need to take into account the needs for developing a universally applicable metrics framework for DoD installations and for identifying and measuring relevant aspects of more specific issues that fit within that general framework on any given base.

Table 1 shows the specific Issues and Elements, within each MSF category, which were identified by the discovery process and found to be of highest priority based on the interviews conducted at NBVC. (Note: The numbers may not be sequential because the original numbers have been preserved and some of the original Issues and Elements identified as low-priority issues were excluded from the set as a result of the metrics development process. A full listing of Issues and Elements developed during the interview process appears in Appendix A for completeness and for consideration by other military installations.)

It is important to note here that the Issues and Elements identified at NBVC may differ considerably for other installations, and will likely be highly dependent on the size and specific mission of an installation. For example, the Issues and Elements for a large-scale training and testing range will include significantly more natural resource issues and elements than would a depot.

The interview process and a summary of the interview results are presented in Appendix B.

Table 1 – Issues and Elements by MSF Category

Mission (“MS”)

<i>No.</i>	<i>Issues & Elements</i>
1.1	Overall readiness condition of the NBVC complex as well as for each of the tenant commands on the base
1.2	Ability to support flight operations and access to airspace
1.3	Ability to train and deploy construction battalions (CB)/squadrons
1.4	Ability to stage and trans-ship materials through the port
1.8	Ability to operate the test range and conduct weapons R&D
1.5	Mission-related vehicle and equipment maintenance status and cost
1.7	Ability to sustain operations in the event of a natural or manmade disaster
1.X	Availability and adequacy of testing facilities and infrastructure

Installation Management (“MG”)

<i>No.</i>	<i>Issues & Elements</i>
2.1	Effectiveness of base management directives
2.2	Management tool implementation, effectiveness, and integration
2.3	Management of physical installation
2.4	Ability to manage people and cultural issues
2.5	Disaster Preparedness Plan

Neighbors & Stakeholders (“NS”)

<i>No.</i>	<i>Issues & Elements</i>
3.1	Overall status and quality of key off-base community relationships
3.3	Community transportation issues
3.4	Encroachment threats, joint land use planning, and action plan

Operations & Maintenance (“OM”)

<i>No.</i>	<i>Issues & Elements</i>
4.2	Buildings and grounds O&M
4.3	Energy availability, reliability, efficiency, and cost
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, and cost
4.5	Wastewater treatment availability and cost
4.8	Landscaping design and efficiency
4.9	Solid waste recycling/disposal – landfill

Environment (“EN”)

<i>No.</i>	<i>Issues & Elements</i>
5.1	Impact of historical or “legacy” environmental issues
5.3	Air quality and emissions
5.4	Hazardous and solid waste streams onto and off of the base
5.5	Storm water runoff - Surface water quality
5.7	Greenhouse gas emissions
5.8	Threatened and endangered species

Quality of Life (“QL”)

No.	Issues & Elements
6.2	Availability of affordable, adequate housing on- and off-base
6.3	Morale, Welfare, and Recreation (MWR) Program and Facilities
6.4	Impact of local retiree community
6.6	Quality, availability, and accessibility of health care
6.7	Employment (Civilian/Spousal)
6.8	Availability and quality of education opportunities

Conceptual Metrics

Selection Process

While the Issues and Elements discovery process defined the items that have an impact on the installation’s sustainability, how to measure them may or may not be readily apparent. “Conceptual Metrics,” the next step in the process, are ideas for appropriate measures to assess the status and trend for a specific Issue or Element. Conceptual Metrics are topical rough drafts; they must be refined by analyzing available data, testing user comprehension, and other actions. Often, in practice, the envisioned metric must be replaced by indirect proxy measures that have better data or which communicate more effectively with the end-user or stakeholder.

To guide the development of the Conceptual Metrics, the following table was borrowed from the documentation on the Defense Readiness Reporting System’s “Mission Essential Task List (METL) Development Process” (undated paper). The chart provides an excellent description of criteria used to identify good metrics, or “measures,” which can also guide further development of the MSF metrics set.

Good Measures	Bad Measures
• Summarize Past and Report Present	• Snapshot of Present
• Link to Task/Goal or Objective	• Free Standing
• Encourage Improvement	• Encourage Detrimental Actions
• Allow Evaluation	• “Gameable”
• Accurate Data	• Incomplete Data
• Wide Distribution	• Close Hold
• Simple and Understandable	• Confusing and Complex
• Used to Find Problems with Task	• Used for Disciplinary Actions

Selection of the Conceptual Metrics presented in this report was guided by the use of *Selection Criteria* adapted from those established through the development of sustainability indicators in multiple contexts since the early 1990s. *Analytical Criteria* also played a part in selection, but these are more meaningful when the metrics are populated with data. Good sustainability metrics for military installations should use the criteria listed in the following table:

Metric Selection Criteria

Specific to NBVC
General for DoD
Systemic
Scalable
Understandable
Relevant

Metric Analytical Criteria

Clear in Direction
Reliable
Reflective of Long-Term Trends
Responsive
As consistent as possible
Makes a direct/indirect impact

These criteria should be used over time to refine and filter the sustainability metrics identified here, to seek better measures or data, and to guide development of a reporting system.

The Conceptual Metrics listed below were developed by the entire project team, including SERDP and NBVC personnel. Research into actual data available for this effort was limited to the identification of probable sources. Most of the metrics include a recommendation for a data source or the kind of data that would be used to populate them, but further refinement of these metrics would require identifying specific data streams and analyses.

The Mission (Military Readiness) metrics should be seen as a special case. The project team recognized that the DRRS-N was being developed concurrently with the MSF system. This system contains the best source of mission readiness data. The team decided that it would be useful to provide a way for the MSF to relate to the DRRS-N at some time in the future. To that end, the DRRS-N commander level metrics *are* the MSF Mission metrics. The one specialized Mission metric for NBVC under the MSF is CB Ops, which is intended to show the commanders' assessment of CBs specifically because of their large footprint at NBVC.

Metric Values

An effort was made to normalize, where appropriate, the conceptual metrics to a 100-point performance scale, similar to that used in DRRS-N, where 100 represents ideal or perfect conditions in all relevant issues being measured and 0 represents an undesirable end-state or total collapse of functionality. This scaling would allow performance scores for all the metrics within each category to be averaged for an overall performance index for that category.

However, normalizing all metrics to a 100-point scale requires 1) knowledge and availability of specific data sources for each metric as well as their range of values and 2) establishment of goals or target values for each metric. It was not within the scope of this effort to determine specific goals for all of the conceptual metrics. This will be an installation-specific effort that will require careful analysis of available data and installation goals. The establishment of goals is addressed further in the Summary and Recommendations section below.

It should be noted that weighting of metrics may be desirable in some instances, but weighting poses a number of challenges, ranging from lack of transparency to large levels of uncertainty about the appropriate weighting factors. Alternatively, assuming the equal weights for all metrics could also lead to misinterpretation. For example, assigning equal weights to a metric that measures the emissions of carbon dioxide and to a metric

for a less significant greenhouse gas or one whose volume is orders of magnitude lower than carbon dioxide emissions could be problematic.

Detailed information on all of these conceptual metrics is found in Appendix C. Anyone considering using this framework at an installation and following the process used here should carefully verify the conceptual metrics and determine if additional metrics should be considered.

NBVC Conceptual Metrics

MSF Category: Mission (MS) (from DRRS-N Readiness Metrics)

No.	Conceptual Metric	No.	Conceptual Metric
MS1	CB Ops – CO	MS10	Anti-Terrorism & Force Protection – CO
MS2	Port Ops – CO	MS11	Emergency Preparedness – CO
MS3	Air Ops – CO	MS12	Personnel
MS4	Ops Support – CO	MS13	Equipment
MS5	Fleet and Family Readiness – CO	MS14	Supply
MS6	Facility Support – CO	MS15	Training
MS7	Environmental – CO	MS16	Ordnance
MS8	Safety – CO	MS17	Facilities
MS9	Command and Staff – CO		

MSF Category: Installation Management (MG)

No.	Conceptual Metric	No.	Conceptual Metric
MG1	Billeting adequacy	MG7	Directives and instructions effectiveness
MG2	Civilian employment	MG8	Buildings certified as sustainable
MG3	Safety performance	MG9	Base master plan implementation
MG4	Staffing levels	MG10	Basic facility sufficiency
MG5	Disaster preparedness rating	MG11	Management tools effectiveness
MG6	Disaster readiness	MG12	Management tool integration across base

MSF Category: Neighbors and Stakeholders (NS)

No.	Conceptual Metric	No.	Conceptual Metric
NS1	“Walkable” on-base community design	NS7	Enforcement actions against NBVC
NS2	Alternative transportation utilization	NS8	Land use planning
NS3	Average commute time for off-base personnel	NS9	Relationship with local/regional zoning authority
NS4	Alternative transportation performance	NS10	Community economic impact of NBVC
NS5	AICUZ effectiveness	NS11	Community perception of NBVC
NS6	Encroachment index	NS12	Direct impact on local and regional business

MSF Category: Operation and Maintenance (OM)

No.	Conceptual Metric	No.	Conceptual Metric
OM1	Building maintenance cost	OM10	Base electrical generation cost
OM2	Maintenance backlog	OM11	Base energy density
OM3	Facilities performance condition	OM12	Power reliability
OM4	Sustainability retrofit status	OM13	Renewable energy
OM5	Organic (natural) water source capacity	OM14	Landscape maintenance costs
OM6	Water conservation implementation	OM15	Solid waste streams
OM7	Surface and ground water status	OM16	On-base wastewater treatment capacity
OM8	Regional water availability	OM17	Wastewater volume
OM9	Water consumption	OM18	On-base water reclamation and reuse

MSF Category: Environment (EN)

No.	Conceptual Metric	No.	Conceptual Metric
EN1	Greenhouse gas emissions on-base	EN7	Endangered species population recovery
EN2	Greenhouse gas emissions off-base	EN8	Water consumption
EN3	Air pollution non-attainment days	EN9	Wastewater flow
EN4	Toxic emissions to air, water, land	EN10	Non-point source water pollution
EN5	Hazardous material usage	EN11	Surface water quality
EN6	Habitat and species protection	EN12	Regional watershed condition

MSF Category: Quality of Life (QL)

No.	Conceptual Metric	No.	Conceptual Metric
QL1	Local community school quality	QL9	Health care responsiveness
QL2	School adequacy	QL10	Health care satisfaction
QL3	Travel to schools	QL11	Public transportation to health care facilities
QL4	Housing accessibility on-base and off-base	QL12	Travel to health care facilities
QL5	Off-base housing affordability index	QL13	Child care accessibility
QL6	Housing satisfaction on-base and off-base	QL14	Child care satisfaction
QL7	Housing sufficiency on-base and off-base	QL15	Quality, availability, and accessibility of child care
QL8	On-base housing availability		

Design for the MSF Reporting Template

Reporting is the final stage in the sustainability metrics development process and is also the most important. Design work on a reporting template need not, and should not, wait for the delivery of finished metrics with pristine data. If metrics do not effectively communicate information to the end-user, they are just useless numbers.

This design for a sustainability reporting template should be viewed as a conceptual sketch that identifies key principles for reporting as well as the elements that should ultimately be produced in document and/or digital display form. Fully applying this template to an installation would require (1) additional graphic design input on the presentation format and user interface(s) and (2) validation by end-users on the usefulness and effectiveness of the presentation in a real-time management context.

In general, a sustainability reporting template needs to meet the needs of end-users at various levels of command. The end-user must also be able to “drill down” into the reporting structure to determine the element or sub-element that is responsible for a reported aggregate value or trend.

At the highest level, the reporting template should provide instant “big-picture” information that is relevant to management at the installation level. It should flag those issues that are current or emerging problems. And it should provide the basis for identifying linkages among issues, by presenting complete-yet-disaggregated visual maps and textual interpretations.

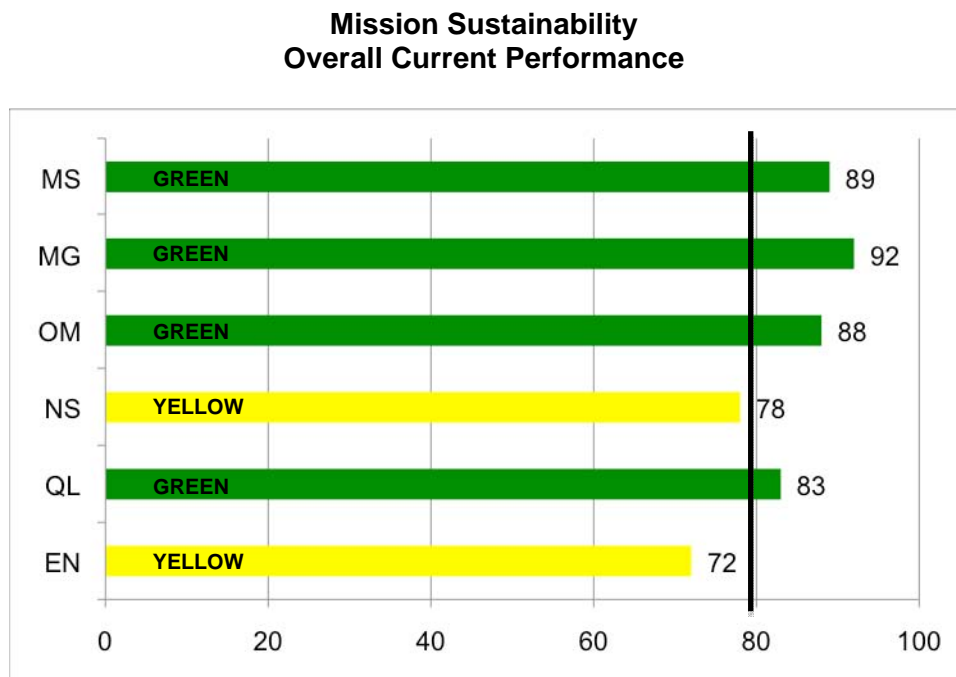
At the lowest level, each of the conceptual metrics in the reporting template should be visible with current data values and trends. In between, individual metrics should be “rolled up” or consolidated to provide a value for an MSF category or for the issue or elements that they represent. How these metrics are rolled up will be dependent upon their relative value within the MSF category. The process may be simple averaging or may include some form of weighting. In turn, the values for the issues and elements are aggregated into a value for the MSF category. Here again, weighting of the various issues and elements may be appropriate, but caution is advised to ensure that the weighting method is transparent and does not introduce additional uncertainty.

To be more specific, the reporting template elements should include a summary; overall index view (highly aggregated performance scale); a tabular view providing instant visual access to the entire metric array (disaggregated cluster); and a detailed view that makes the metric, the data, and the interpretation fully accessible and transparent to the end-user.

These are the design principles that guided development of the following MSF reporting template. Note that this template is a mock-up and is not based on real data.

Summary - Overall Index View

This conceptual index view provides an overall current performance score for each of the six MSF categories. The view provides information at a glance regarding which categories are underperforming.



With the metrics being normalized to a 100 point scale, the acceptable readiness threshold could be defined as 80. Green indicates that the index overall is over the readiness threshold and is “sustainable”. Yellow indicates action is necessary to achieve acceptable readiness. Indices falling under a predetermined threshold could be flagged red—unacceptable conditions for readiness. Without actual data and goals for each metric, the color coding in the examples shown here are conceptual and meant only to illustrate potential methods to visualize sustainability metrics.

“Hot” issues that individually have the capacity to harm readiness (and which might be hidden by an overall index) are more visible in the Management Summary - Table View.

Installation Management Summary - Table View

The Management Summary table view provides at-a-glance updates on the *status*, *vulnerability*, and *urgency* of specific indicators under each category. The assessment is an interpretation of the data, designed to flag areas requiring priority attention and action. *Status* indicates current performance. *Vulnerability* is a subjective/experience-based assessment of the trend: are things worsening or in danger of worsening? *Urgency* is a product of status, vulnerability, and time variables, such as (for example) approaching thresholds in ecosystem decay, rapidly accelerating problems in perceived QOL, or imminent risk of court proceedings by outside actors. *Urgency* signals that the installation is heading toward “tipping points” in a system, points of no return that could cause long-term damage that is very difficult to repair.

Sustainability Assessment of a Military Installation: Design for a System of Reporting

In this mock-up of the Management Summary - Table View, the indicators and sequencing reflect the priorities identified by the participants in the NBVC interviews as being of greatest importance to them. The green-yellow-red coding system is keyed to the 100-point performance scale primarily described and should therefore also harmonize with the DRRS-N.

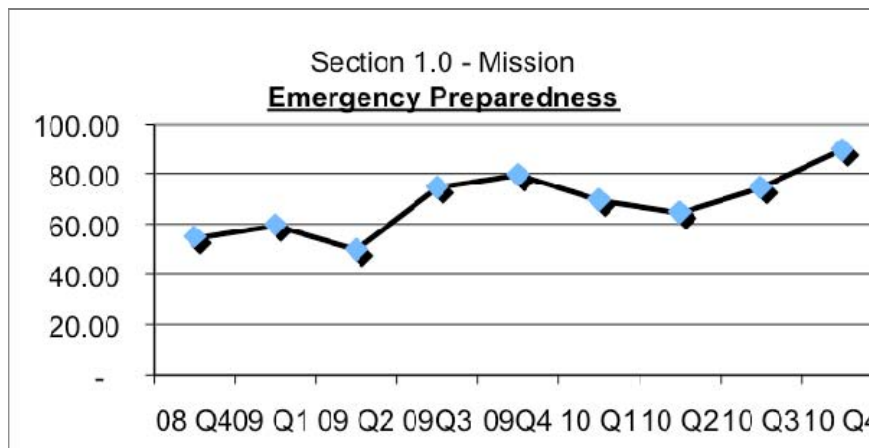
		Status	Vulnerability	Urgency
1. MISSION (MS)				
MS9	Overall readiness-Command and Staff			
MS3	Air Ops			
MS1	CB Ops training and deployment capacity			
MS4	Ops Support (Identify issues impacting mission)			
2. INSTALLATION MANAGEMENT (MG)				
MG9	Base Master Plan Implementation			
MG5	Disaster Preparedness Rating			
MG4	Staffing levels (command manpower)			
MG8	Buildings certified as sustainable			
MG11	Management tool effectiveness			
3. NEIGHBORS AND STAKEHOLDERS (NS)				
NS6	Encroachment Index			
NS5	AICUZ Effectiveness			
NS3	Average commute time for off-base personnel			
NS9	Relationship with local/regional zoning authority			
4. OPERATION AND MAINTENANCE (OM)				
OM10	Base electrical generation cost			
OM5	Organic (natural) water source capacity			
OM12	Power reliability			
OM1	Building maintenance cost			
5. ENVIRONMENT (EN)				
EN2	Greenhouse gas emissions on- and off-base			
EN4	Toxic emissions to air, water, land			
EN7	Endangered species population recovery			
EN1	Operational impacts from environment issues			
6. QUALITY OF LIFE (QL)				
QL10	Health care satisfaction			
QL6	Housing satisfaction on- and off-base			
QL2	School adequacy			
QL15	Quality, availability, and accessibility of child care			

Not all Issues and Elements may have objective metrics and data that can provide an objective basis for evaluating status, vulnerability, and urgency. Proxies must be found to provide decision-makers with adequate management information – for example, using the informal assessment of staff closest to those issues.

Individual Metrics - Indicator View

At the individual metrics indicator view, the data may be presented graphically and interpreted in short explanatory texts with web-based access to actual numbers in Excel spreadsheet format (where appropriate). The following are **conceptual examples**, one metric per category of the MSF, that are not based on actual data and goals, but are presented as starting templates that may be used for further development. Included with each example metric indicator view are example text summaries that could accompany each metric. A brief description of what each indicator graph represents is followed by a brief summary of the depicted trend, followed by a summary of emerging issues, which may be used to highlight expected improvements or emerging issues of concern.

MISSION MS11 - Emergency Preparedness



● **Status - 90** ● **Vulnerability** ● **Urgency**

Description

Assessment of ability to respond to disasters and emergency conditions. This is a notional index that could be based on staffing (e.g., percentage of required positions filled), resources (e.g., percentage of required resources requested that have been received), or performance scores during emergency preparedness exercises.

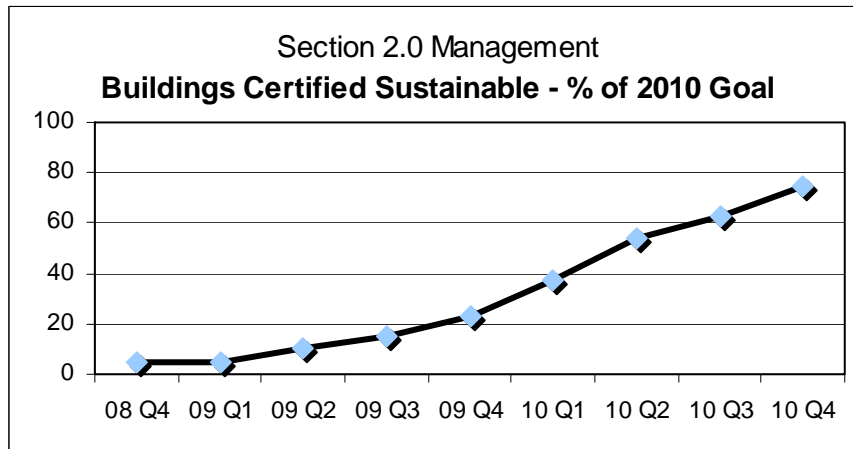
Trend

General improvement with recent up and down oscillations. The oscillations are due to staffing and resource availability.

Emerging Issues

This section would provide a short summary of known changes occurring in the elements of this index, which could improve or deteriorate conditions going forward.

INSTALLATION MANAGEMENT MG8 – Sustainable Building Certification



◆ **Status - 75** ◆ **Vulnerability** ◆ **Urgency**

Description

Measure of buildings built or retrofit to meet new sustainability standards as a percentage of a goal to achieve by 2010.

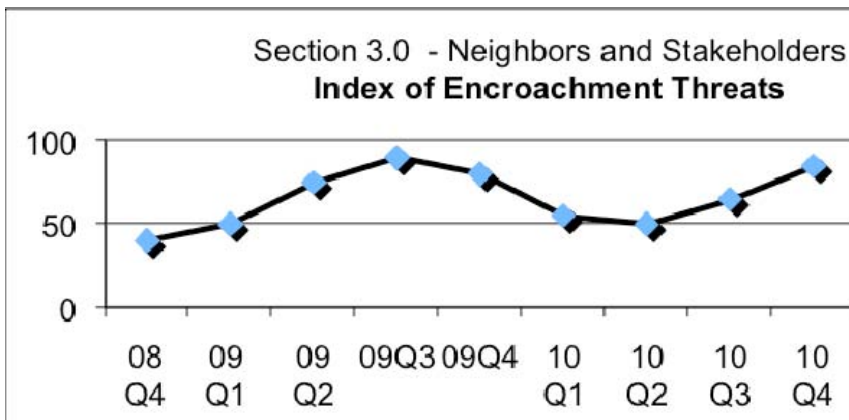
Trend

Building program is proceeding mostly on target with some initial delays

Emerging Issues

Budgets could be adjusted in the future and cause a change (up or down) in the expected performance rate and in the resources available to pursue the long-term goal

NEIGHBORS & STAKEHOLDERS NS6 - Encroachment



● **Status - 82** ● **Vulnerability** ● **Urgency**

Description

A notional index derived from defined encroachment activities such as the number of agreements with local/regional planning authorities, compliance of local land use patterns with AICUZ, or percentage of JLUS recommendations implemented.

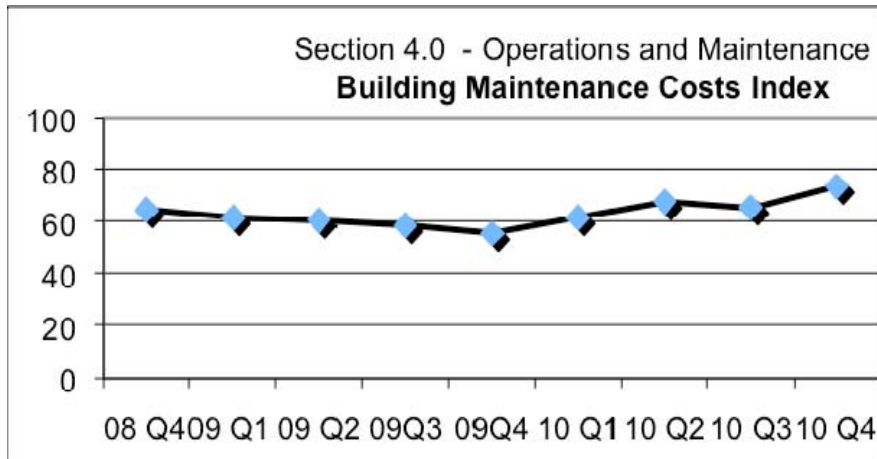
Trend

Encroachment activity levels currently low and falling, resulting in a high and improving index performance score

Emerging Issues

Economic conditions in the surrounding community reduce likelihood of further encroachment activity for the foreseeable future, but projects already in the pipeline could still be approved and merit observation (hence the “Yellow” in Vulnerability)

OPERATION & MAINTENANCE OM1 - Building Maintenance Cost



◆ **Status - 72**

◆ **Vulnerability**

◆ **Urgency**

Description

A notional index that compares actual maintenance costs to target maintenance budgets

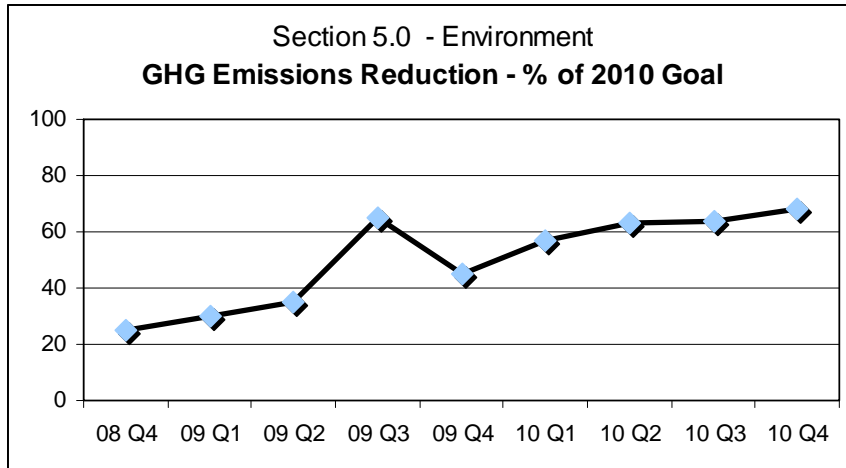
Trend

Still over budget but improving over four quarters after a year of increasing problems

Emerging Issues

Additional “unexpected” problems cropping up with predictable frequency; maintenance program needs additional resources and/or better management

ENVIRONMENT EN1 - Greenhouse Gas Emissions On-Base



● **Status - 68**

● **Vulnerability**

● **Urgency**

Description

Net greenhouse gas (GHG) emission reductions, including actual reductions, green purchasing, and offsetting activity, as a percentage of 2010 goal for emissions GHG reduction

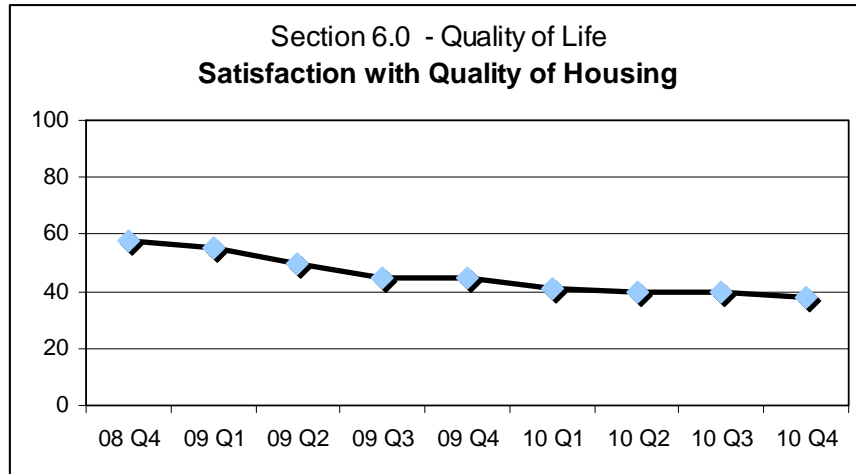
Trend

Improving over four quarters after a year of decline, but improvement rates remain unacceptably low

Emerging Issues

Additional public, state, and federal performance pressures will bring the installation under increasing press scrutiny if performance does not begin to improve more quickly

QUALITY OF LIFE QL6 - Housing Satisfaction On- and Off-Base



● **Status - 38**

● **Vulnerability**

● **Urgency**

Description

A notional index that measures the percentage of those stationed at installation who report being “fully satisfied” with housing options [note that the index score of 100 is the goal for percent fully satisfied which may be less than 100%]

Trend

In steady decline over two years, and falling

Emerging Issues

The community around the installation is increasingly considered “distressed,” with rising levels of crime and unemployment; this is contributing to declining satisfaction with housing on- and off-base and resulting loss of talented and experienced personnel

Summary and Recommendations

This report is a design guide for the development of a full set of sustainability metrics and reporting system to support the sustainable management of a U.S. military base. Its purpose will only be fully realized when a prototype sustainability metric system is built, tested, and validated at one or more representative military installations..

To be fully realized and used, this set of metrics would need to go through the following additional steps:

- Validate and finalize the metrics in dialogue with end-users and stakeholders (this includes limiting the set to a manageable number of measurable indicators and making initial assessments of data availability and quality)
- Acquire available data and make additional adjustments to the metrics set (data acquisition always results in some adjustment of the metrics themselves)
- Establish goals for each metric based on installation command goals, DoD policy and directives, and the information gained by establishing the metrics. Identify when and how these goals may change over time.
- Interpret the data in standardized graphic form with explanatory text
- Develop a final report that highlights important findings and generally presents the metrics in a useful and transparent way. This report presented the results in an initial display format as a starting point for further development

Sustainability Metrics and Sustainability Goals

This effort developed sustainability metrics from the installation perspective based on surveys of installation personnel and the issues they address on a daily basis. For some of these metrics, goals may be easily determined (e.g., zero waste water discharge). However, in many cases, specific goals for sustainability metrics might not be clear and will require input based on DoD or policy or directives.

Alternatively, sustainability programs may specify goals from the top down and metrics then need to be developed to measure and monitor progress towards these goals. In some cases, these goals may change over time (e.g., target reductions in greenhouse gas emissions by 2010, 2020, and 2030). For some broad sustainability goals, measurable metrics may not be clear or may not exist.

Therefore, a key conclusion of this effort is that it is anticipated that sustainability goals and metrics will require a combination of a top-down and bottom-up approach that is based on DoD policy and goals and that considers how installation personnel address sustainability issues on a daily basis.

The team producing this report shares the view that having visible metrics and indicators that monitor the trends in important topics related to the sustainability of military installations are vital early steps to awareness, mitigation, and adaptation. They are key

elements for achieving an installation's sustainability goals and for sustaining the capacity to perform the mission and to do so at lower risk and lower cost.

Natural Resource Metrics and Goals

It should be noted that as an example installation, NBVC is more urbanized than many training installations that have more direct interaction with their land and water resources. In addition, the science of natural resource sustainability--more recently couched in terms of continued supply of ecosystem services--is still immature with respect to what resource managers and decision makers need to know beyond compliance mandates and what current scientific understanding can provide. Therefore, establishing metrics to measure and monitor natural resources issues and establishing goals for natural resource metrics could prove to be challenging. These observations point to a need for additional research that can provide natural resource managers at DoD installations with the information they need to sustainably manage installation resources.

Identifying Science and Technology Research Needs

Similarly, an installation's effort to develop metrics, establish a sustainability reporting system and meet sustainability goals may reveal a need for new science and technology to address requirements that cannot be met with the current understanding or existing technologies. An effective reporting system may identify areas in need of improvement that can lead to the identification of specific science or technology requirements and indeed, this was one of the original goals of this effort. These requirements should be communicated to the Services and DoD to ensure that future research and development investments can be made that will enhance DoD's ability to meet sustainability goals.

This report is submitted with the recommendation that it be used as the basis to develop a full, pilot system of sustainability metrics for a U.S. military base and that this be integrated with DRRS-N and other initiatives to the extent possible and appropriate. Given the familiarity with the MSF already established, NBVC would be an obvious choice for such a pilot project.

APPENDIX A: Complete List of Issues and Elements

From an interim project report *Sustainability Issues, Elements and Metrics:
Results of a Phone Survey at Naval Base Ventura County*

Issues and Elements Complete List

1. Mission (MS)

- 1.1 Overall readiness of the NBVC complex as well as for each of the tenant commands on the base
 - Ability to synchronize multiple major activities
 - Material condition
 - Manning levels
 - Personnel readiness (training)
 - Adequacy of support infrastructure
- 1.2 Ability to support flight operations, train and deploy squadrons, and operate the test range
 - Air field safety
 - Interface with China Lake
 - Access to airspace
 - Availability of flight hours
 - Airfield and supporting buildings material condition
 - Air emissions restrictions
 - Noise restrictions
 - Access to radio spectrum
 - Aircraft maintenance and repair
 - AICUZ restrictions/encroachment
- 1.3 Ability to train and deploy CBs
 - Dependency on Fort Hunter-Liggett
 - Availability and access to areas for equipment movement evolutions
 - Adequacy and material condition of training facilities and equipment
 - Adequacy of trained instructors
 - Secure storage and maintenance of battalion equipment
 - Access to railhead/port/airhead
- 1.4 Ability to stage and trans-ship materials through the port
 - Assured deep water access
 - Access to railhead/airhead/roads
 - Adequacy and material condition of piers, wharves, and cargo handling equipment
 - Adequate staging area
- 1.5 Mission-related vehicle and equipment maintenance status and cost
 - Alternative fuel usage
 - Access to fuel/fuel usage
 - Secure storage
 - Availability of parts
 - Trained maintenance personnel

- 1.6 Assessment of the extent to which the base is dependent on “workarounds,” defined as suboptimal short-term solutions to operational problems
 - Identify source of problem (lack of funds, lack of manpower, regulatory issues, etc)
 - Identify which critical areas are subject to workarounds
 - Management or planning policies to reduce the need for workarounds
- 1.7 Ability to identify issues impacting mission
 - Weather forecasting
 - Bird migration forecasting
 - Non attainment/bad air quality days
 - Loss of electrical grid power
- 1.8 Ability to sustain operations in the event of a natural or manmade disaster
 - Adequate disaster/recovery plan
 - Organic capability to generate electricity
 - Organic capability to provide water/sewer services
 - Organic capability to provide medical services
 - Adequate fuel stores
 - Adequate food stores
 - Adequate emergency shelter
- 1.9 Ability to operate the test range and conduct weapons R&D
 - Access to air space
 - Electromagnetic spectrum interference
 - Weapons testing safety
 - Response times to testing requests
 - Infrastructure and facility flexibility
 - Interface with China Lake
 - Interface with other DoD departments
 - Testing services for international clients

2. Installation Management (MG)

- 2.1 Completeness and effectiveness of base management directives, compliance with regional and national directives
 - Do command directives/instructions accurately describe current processes/procedures?
 - Is there a process through which base management directives can be updated or modified in response to ground reality or the need for workarounds?
- 2.2 Command culture and traditions
 - Supporting the positive aspects of Navy culture and tradition (Can Do spirit)
 - Downplaying negative stereotypes (hard drinking sailors)
 - Supporting a climate that allows or encourages ideas or suggestions to be made back up the chain of command

- 2.3 Command Master Plan
 - Realistic planning
 - Consideration of alternate future scenarios
 - Regional context
 - Adaptability based on experience
- 2.4 Integrated Natural Resources Master Plan/Integrated Cultural Resources Master Plan
 - Consultations with Fish and Wildlife at Federal, State and regional levels
 - Consultations with SHPO
 - Managing threatened and endangered species/habitat
- 2.5 Disaster Preparedness Plan
 - Contingency planning
 - Available resources
 - Scenario development
 - Organic capability
 - Interface with local/state Emergency Management
- 2.6 MILCON and sustainable building practices
 - Responsive development process
 - LEED or other certification
 - New construction standards
 - Energy conservation goals
 - Alternative energy development
- 2.7 Space management/building occupancy effectiveness
 - Building and grounds space leasing program
 - Appropriate sustainment, restoration, and modernization (SRM) investments
 - Space per person by functional area compared to standards
 - Occupancy rates
 - Surge capacity
- 2.8 Command manpower/Human Resources
 - Adequate manpower allocation/billet structure
 - Manning level (i.e., % of allocation)
 - Adequate training
 - Ability to recruit/retain quality personnel
- 2.9 Management tools implementation and effectiveness
 - Lean Six Sigma
 - Balance of user/local/regional decision-making
 - Business model as service and profit centers
 - BRAC analyses and data calls
 - Defense Readiness Reporting System Navy (DRRS-N)

3. Neighbors and Stakeholders (NS)

- 3.1 Overall status and quality of key off-base community relationships
 - Interface with local government (City/County)

Sustainability Assessment of a Military Installation: Design for a System of Reporting

- Interface with key non-governmental organizations (local, regional, national)
 - Investment in building positive local and regional image and relationships
- 3.2 Access to necessary resources
 - Electricity, water, sewage
 - Public Education
 - Transportation
 - Medical care/facilities
- 3.3 Transportation issues
 - Rail and Truck access and traffic
 - Availability of carpooling
 - Commute distance/time
 - Access to public transit
- 3.4 Encroachment threats, joint land use planning, and action plan
 - Currency of JLUS study, if any
 - Interface with local zoning authority
 - Interface with local and regional planning commissions
 - Projections of changes in demographics/land use
- 3.5 AICUZ (Air Installation Compatible Use Zones)
 - Waterfowl habitat and local hunting club
 - Safety issues - BASH
 - Is AICUZ current ?
 - Does AICUZ anticipate future missions/aircraft?
- 3.6 Public outreach
 - Number of public speaking engagements by NBVC officials
 - Number of public participants in NBVC 'Open House' events
 - Positive coverage in local/regional press
 - Participation in and support of local and regional projects and events
- 3.7 Local/regional regulatory issues
 - Air emissions
 - Noise
 - Water quality/runoff
 - Building restrictions

4. Operation and Maintenance (OM)

- 4.1 Buildings and grounds space utilization
 - Quality and appropriateness of space provided for each tenant
 - Space per person by usage
 - Surge capacity
- 4.2 Buildings and grounds operations and maintenance
 - Age of buildings, cost of maintenance vs. replacement
 - Timely and cost effective execution of facility services
 - Building maintenance cost per square foot (sq/ft) by type

- Building maintenance backlog
 - Grounds maintenance cost/area
 - Chronic maintenance problems or deficiencies
- 4.3 Energy availability, reliability, efficiency, and cost
- Revenue stream to base from energy distribution
 - Water purveyors outside the fence
 - Energy usage per sq/ft (energy density) by type (office space, industrial space, hangars, warehouses, housing)
 - Mean time between failure/repair time
 - Emergency generation capacity
 - Renewable/alternate energy resources
 - Energy conservation
- 4.4 Freshwater quality, quantity, availability, reliability, efficiency, and cost
- St. Nicholas island
 - Condition of delivery systems
 - Usage per capita, total and by application
 - On-base sources
 - Emergency production capacity
 - Salt water intrusion
 - Status of aquifer
 - Water conservation/recycling
- 4.5 Wastewater treatment availability and cost
- Per capita waste water production by type (domestic and industrial)
 - On-base treatment capacity (domestic and industrial)
 - Water recycling (domestic and industrial)
- 4.6 Support (indirect mission-related) vehicle and equipment O&M
- Fleet fuel efficiency
 - Electric/Hybrid/Flex Fuel
 - Alternative fuel usage
 - Secure storage
 - Availability of parts
 - Trained maintenance personnel
- 4.7 Response and recovery to utility outages and interruptions
- Mean time between failure
 - Mean time to repair/restoration of service
 - Emergency generation capacity
- 4.8 Landscaping design and efficiency
- Water usage
 - Aesthetics
 - Use of toxic materials
 - Nutrient/sediment run off, surface water quality
 - Design for reduced energy use (e.g., ground cover that does not need mowing)

4.9 Solid waste recycling/disposal – landfill

- Solid waste diversion rate
- Mass of material sent to landfill
- Waste to energy conversion
- Recycling operations
- Landfill capacity
- Cost to use public landfill
- Landfill gas utilization

5. Environment (EN)

5.1 Status of historical or "legacy" environmental issues

- Legacy land use
- Contaminated soil and/or water

5.2 Operational impacts from environmental issues – notices of violation (NOV)

- Severity of NOVs
- Number of work stoppages due to NOVs
- Numbers of NOVs
- Sources of NOVs

5.3 Air quality and emissions

- Air permits
- TRI emissions
- Non-attainment areas

5.4 Hazardous and solid waste streams onto and off of the base

- Solid waste diversion rate
- Mass of material sent to landfill
- Waste to energy conversion
- Landfill capacity
- Cost to use public landfill
- Hazardous Material Handling procedures

5.5 Storm water runoff – surface water quality

- Storm water management plan
- Flooding
- NPDES permits
- Lagoon water quality

5.6 Land cover changes on- and off-base

- JLUS status, if any
- Land use change predictions
- Land use planning

5.7 Carbon emissions, including impacts of green energy purchases

- Renewable energy
- Energy conservation
- Energy usage
- Alternative fuels

- Electric/hybrid/flex fuel vehicles
- Mass transit/carpooling
- 5.8 Threatened and endangered species
 - Overlap with wetlands program
 - Link to BASH issues
 - Numbers of TES
 - Habitat delineation/preservation
 - Status of recovery plans
 - Status of recovery populations
- 5.9 Status of wetlands, watershed, and other natural habitat
 - Overlap with Threatened and Endangered Species program
 - Link to BASH issues
 - Wetlands area
 - Wetland bank
 - Watershed quality and stability
 - Coastal beach habitat
 - Waterfowl habitat

6. Quality of Life (QoL)

- 6.1 Health and perceived QoL of military personnel, families and civilians
 - Complaint levels
 - Topics of frequent complaints
 - Retention rates
- 6.2 Availability of affordable, adequate housing on- and off-base
 - Median house price vs. median annual household income
 - Base housing vacancy rate
 - Off-base housing vacancy rate
- 6.3 Morale, Welfare, and Recreation (“MWR”) Program and Facilities
 - Adequacy of MWR facilities
 - Usage rates of MWR facilities
 - Availability at Port Hueneme vs. Pt. Mugu
 - Commissary
 - Navy Exchange
- 6.4 Impact of local retiree community
 - Retiree usage of facilities
 - Size of local retiree community
 - Volunteer support
- 6.5 Quality, availability, and accessibility of child care
 - On-base availability/cost
 - Off-base availability/cost
 - Long-term child care for deployed parents

- 6.6 Quality, availability, and accessibility of health care
 - On-base medical care (dispensary, hospital)
 - Distance to nearest hospital
 - Availability/responsiveness of EMS
 - Availability of advanced medical systems (MRI, CAT, etc)
- 6.7 Availability of spouse employment opportunities
 - Civilian job vacancy rate
 - Distance to spouse employment
 - Spouse employment salary
- 6.8 Availability and quality of education opportunities
 - On-base college programs?
 - Distance to nearest off-base college program
 - Adequate primary and secondary education for families
- 6.9 Attractiveness as a duty station
 - Return tours of duty by military personnel
 - Opportunities for promotion
 - Retention rate of civilians
 - “Location request” rates
- 6.10 Access to services and amenities
 - Travel time from Pt. Mugu to Port Hueneme
 - Dining facilities’ quality and quantity at Pt. Mugu
 - Civilian access to amenities at NBVC
 - Equal access by Port Hueneme and Pt. Mugu personnel
 - Adequate exchange/commissary facilities
 - Price differential between exchange and civilian stores
 - Price differential between commissary and civilian stores
- 6.11 Personnel transition into and out of NBVC
 - Warrior transition back for deployment in war zones
 - Personnel new to the military
 - Rotations into NBVC
 - Rotations out of NBVC
 - Family transitions into NBVC
 - Family transitions out of NBVC

APPENDIX B: Descriptive Details on Telephone Survey Results

*Extracts from the interim project report Sustainability Issues, Elements and Metrics:
Results of a Phone Survey at Naval Base Ventura County*

Executive Summary - Excerpts

NBVC consists of 73 commands, two separate locations (Pt. Mugu is primarily an air base and test range, and Port Hueneme is primarily a port and CB base), and 1,500 buildings. NBVC exists to fulfill three main functions, training, mobilization, and testing. But it also serves many commands not directly associated with these three functions.

During the project, 28 telephone interviews documenting sustainability issues and metrics were conducted with command personnel, Commanding Officers (CO) and Executive Officers (XO) in military commands and with managers of civilian departments at (NBVC). Each participant was responsible for an organization with a specific mission.

The interviews were conducted between 01 July and 31 August 2008. A survey developed by the project team prior to the interviews provided the basis for the interview content. The structured interview format was designed to elicit qualitative information about the important issues at the base, in the context of the MSF, and possible metrics for measuring the status and trends in those issues.

Results of the interviews yielded information in three major areas, Management and Sustainability, Issues and Elements, and Metrics.

Management and Sustainability

New insights were gained regarding the management of NBVC and how management methods and dynamics might impact sustainable development of NBVC. The importance of community perceptions of the base demonstrated that more community-based metrics would help complete the MSF metrics. It also became clear during interviews that business models, most notably LEAN and Six Sigma, are being implemented. The MSF must interface with these models in order to be relevant.

Issues and Elements

A list of potential issues and elements important to sustainability of NBVC was initially reviewed by interview participants. They identified three new issues and forty new elements which were added to the list. The three new issues were

- 1.9 Ability to operate the test range and conduct weapons R&D
- 2.9 Management tools implementation and effectiveness
- 6.11 Personnel transition into and out of NBVC.

These issues and the new elements are listed in Appendix C.

Quality of Life emerged as a very important MSF category for most of the participants. Several said it was second in importance only to Mission.

Metrics

Few specific metrics emerged from the interviews. However, numerous general ideas about metrics that would enhance sustainability of the base were offered that could help guide metrics development. Additionally, many data sources were identified in the interviews that will help research the metrics.

It became clear that the interviewees identified three main elements as necessary for the sustainability of NBVC:

- the base itself (infrastructure and services)
- the commands (their activities in meeting their missions)
- the surrounding community (social, economic, and environmental components).

The system of metrics needs to cover these three areas and to distinguish carefully among them.

A key finding of this process is that data is currently underutilized in the management of NBVC. While everyone responded to data calls, as they must, most of the interviewees had few or no metrics or data they used. This implies that the MSF will need to address how to use metrics and do that in a way that is very useful to the command and management at the base. The ultimate design of the metrics for this Mission Sustainability Framework needs to contribute to an increased utilization of metrics generally, as well as of the new metrics to be introduced as a component of sustainability-oriented management. There are similar implications for the generalization of the MSF for all DoD bases.

In addition, the practical implementation of these metrics blends general issues that are universal to military installations, with specific issues that are relevant only to NBVC. The final product of this metrics development project needs to take into account the needs for developing a universally applicable metrics framework and for identifying and measuring relevant aspects of more specific issues that fit within that general frame.

APPENDIX C: Candidate Metrics - Complete List

(Tier 1 = primary metric candidates, Tier 2 = secondary metric candidates, Tier 3 = tertiary metric candidates)

1. MISSION (MN) (All Tier 1)				
	Issue/Element	Conceptual Metric	Suggested Data (DRRS-N)	Comments
1.1	Overall readiness condition of the NBVC complex as well as for each of the tenant commands on the base	CB Ops - CO	DRRS-N: commanders' assessments	Special metric in recognition of the large footprint of the CBs at NBVC
1.2	Ability to support flight operations and access to airspace	Port Ops - CO	DRRS-N: commanders' assessments	
1.3	Ability to train and deploy CBs/squadrons	Air Ops - CO	DRRS-N: commanders' assessments	
1.4	Ability to stage and transship materials through the port	Ops Support - CO	DRRS-N: commanders' assessments	
1.8	Ability to operate the test range and conduct weapons R&D	Fleet and Family Readiness - CO	DRRS-N: commanders' assessments	
1.5	Mission related vehicle and equipment maintenance status and cost	Facility Support - CO	DRRS-N: commanders' assessments	
1.7	Ability to sustain operations in the event of a natural or manmade disaster	Environmental – CO	DRRS-N: commanders' assessments	
1.X	Availability and adequacy of testing facilities and infrastructure	Safety - CO	DRRS-N: commanders' assessments	
		Command and Staff – CO	DRRS-N: commanders' assessments	
		Anti-Terrorism & Force Protection – CO	DRRS-N: commanders' assessments	
		Emergency Preparedness - CO	DRRS-N: commanders' assessments	

1. MISSION (MN) (All Tier 1)				
	Issue/Element	Conceptual Metric	Suggested Data (DRRS-N)	Comments
		Personnel	DRRS-N: PESTOF Pillar data	
		Equipment	DRRS-N: PESTOF Pillar data	
		Supply	DRRS-N: PESTOF Pillar data	
		Training	DRRS-N: PESTOF Pillar data	
		Ordnance	DRRS-N: PESTOF Pillar data	
		Facilities	DRRS-N: PESTOF Pillar data	
	Note: Metrics do not correspond with Issues/Elements because a decision was made by the project team to use DRRS-N metrics without modification. The exception to this is the CB Ops metric, which it is hoped can be extracted from DRRS-N			

2.0 INSTALLATION MANAGEMENT (MG)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
2.4	Ability to manage people and cultural issues	Billeting adequacy	1	Military jobs filled compared to needs	Closer to 100% or other goal, the better	Ratio of filled/allowed billets	Ratio x 100	Command Office
2.4	Ability to manage people and cultural issues	Civilian employment	1	Occupations compared to staffing for NBVC	Closer to 100% or other goal, the better	Ratio of hires/needs x 100	Ratio x 100	HRSC
2.4	Ability to manage people and cultural issues	Safety performance	1	Incident count by category; data and analysis done by safety office	Compare current value to historical maximum	Incidents by type	(max value – current value) / max value x 100	NBVC Safety Office
2.4	Ability to manage people and cultural issues	Staffing levels	1	Military personnel by occupation	Closer to 100, the better	Ratio of needs/on boards	Ratio x 100	Command Office
2.5	Disaster Preparedness Plan	Disaster preparedness rating	1	Checklist for sustainability elements in Disaster Preparedness Plan based on list of MSF elements	Plan is up to date and approved by command and HQ as appropriate	% of checklist items up to standards	Percent value x 100	NBVC Planning Office
2.5	Disaster Preparedness Plan	Disaster readiness	1	See 1.7 Ability to sustain operations in the event of a natural or manmade disaster	Goal is 100%	% Commands signed off on disaster preparedness plan	Percent value x 100	NBVC Planning Office

2.0 INSTALLATION MANAGEMENT (MG)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
2.1	Effectiveness of base management directives,	Directives and instructions effectiveness	1	Survey of work processes and how they fit with instructions and directives	Percent of directives or instructions perceived as useful or not requiring revision or update	% of directives and instructions not requiring revision or update; or survey of effectiveness	Percent value x 100	NBVC Business Office
2.3	Management of physical installation	Buildings certified as sustainable	1	Number of LEED or High Performance Sustainable Building certifications	Progress toward 15% by 2015 goal; 100% goal for new construction	% of eligible buildings certified; % of new construction that is LEED certified	Percent value x 100	Public Works (PW)/ Planning Office
2.3	Management of physical installation	Base master plan implementation	1	Master Plan on scheduled update cycle; additions and deficiencies to plan noted	Progress towards completing and updating master plan	% plan is complete	0=no plan, 75=Draft plan; 100=plan complete and up to date	NBVC Planning Office
2.3	Management of physical installation	Basic facility sufficiency	1	Basic Facility Requirements (BFR) Space necessary and sufficient to carry out mission	Compliance with BFR; is BFR current?	% BFR space available to space required	Percent value x 100	PW/Planning Office

2.0 INSTALLATION MANAGEMENT (MG)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
2.2	Management tool implementation, effectiveness, and integration	Management tool(s) effectiveness	1	% of users satisfied with tool effectiveness; % improvement demonstrated by area or task	Use of management tools across command results in improved processes and efficiencies. EMS, Lean Six Sigma, fiscal management tools, etc.	Survey of user satisfaction or measure of process improvement before and after tool application	Percent value x 100	NBVC Business Office
2.2	Management tool implementation, effectiveness, and integration	Management tool integration across base	1	Management tools use by components	Survey of commands	% of components using tools	Percent value x 100	NBVC Business Office
2.4	Ability to manage people and cultural issues	Personnel turnover	2	Hires and departures	Ratio compared to regional, national, and DoN averages	Actual annual turnover compared to target or average	Percent value x 100	HRSC
2.5	Disaster Preparedness Plan	Plan developed in concert with local emergency management agencies	2	Stakeholders involved	Goal is involvement w/ all applicable stakeholders	% of stakeholders participating vs. number that could/ should be in plan	Percent value x 100	NBVC Planning Office

2.0 INSTALLATION MANAGEMENT (MG)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
2.5	Disaster Preparedness Plan	Exercises to assess effectiveness	2	Number of exercises per scenario	100% is goal	% of exercises vs. number in plans	Percent value x 100	NBVC Planning Office
2.3	Management of physical installation	Facilities retrofitted for sustainability	2	Number of retrofitted buildings	Progress toward 15% by 2015 goal	% of eligible buildings retrofitted	Percent value x 100	PW from 4.2
2.3	Management of physical installation	Maintenance Backlog	2	SPM	Work not classified as backlog as % of SPM work;	Ratio of number of deferred repairs to target number	Percent value x 100	PW
2.2	Management tool implementation, effectiveness, and integration	Adoption of tools across the installation	2	Personnel trained in management tools	% of plan trained from training plans	Ratio of number of personnel trained vs. plan	Percent value x 100	NBVC Business Office
2.2	Management tool implementation, effectiveness, and integration	Success in achieving goals identified in plans	2	INRMP/ICRMP goals	Number of projects vs. goals	% of projects implemented or completed vs. planned	Percent value x 100	NBVC Environmental Office
2.3	Management of physical installation	Adequacy of GIS coverage	3	Complete GIS coverage up to date	Base coverage, layer coverage	% of base coverage	Percent value x 100	PW/Planning Office
2.3	Management of physical installation	Number of emergency repairs	3	SPM	current number of emergency repairs vs. historical max value	% of repairs that are not emergencies	Percent value x 100	PW

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.3	Community transportation issues	"Walkable" on-base community design	1	"Walkable" community Design – on-base: clustering of facilities, presence of sidewalks, need for car, access to public transit	LEED for Neighborhood Development (ND)	0-100 index based on score of walkable community indicators	Adapt LEED-ND scores to 0-100	Survey or results of LEED ND analysis
3.3	Community transportation issues	Alternative transportation utilization	1	Percentage of commute in carpools, public transit, on foot and on bicycles (i.e., other than personal car)	Actual % alternate transport utilization compared to target %	Ratio of actual % of commuters using alternate transportation used compared to goal	Percent value x 100	Rule 210 NBVC - transportation office or annual survey/county data
3.3	Community transportation issues	Average commute time for off base personnel	1	Commute time in minutes, based on survey or census data	Compared to average state or regional commute or target commute time	Ratio of average commute time to target commute time	Percent value x 100	Rule 210 NBVC - transportation office; census data for state average
3.3	Community transportation issues	Alternative transportation performance	1	Percentage commuter satisfaction with transit (e.g., carpool, rideshare, bus, light rail) options	Annual survey/county data; goal could be 90-100% satisfaction	Percentage satisfied w/ alternative transportation performance	Percent value x 100	Ventura County Transportation Commission

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.4	Encroachment threats, joint land use planning, and action plan	AICUZ effectiveness	1	Is AICUZ current? Are local LU patterns compliant with the local ideal AICUZ?	AICUZ checklist	AICUZ Current? Y/N Local LU Compliant? Y/N	N=0 and Y = 100; or sliding scale of degree of completion (with 100 = complete/compliant)	Planning
3.4	Encroachment threats, joint land use planning, and action plan	Encroachment index	1	Base planners encroachment data; Joint Land Use Study (JLUS)	Index to measure monitor encroachment issues	% of encroachment threats being addressed with action plan	Percent value x 100	Planning/NBVC Environmental; Environmental Division - Base Planner
3.4	Encroachment threats, joint land use planning, and action plan	Enforcement actions against NBVC	1	Number of enforcement actions from local/regional authority	Global reporting Initiative (GRI) Indicator SO8	Number of actions compared to goal (e.g., 0)	0 actions =100; historical max number = 0	Planning/NBVC Environmental; Environmental Division - Base Planner
3.4	Encroachment threats, joint land use planning, and action plan	Land use planning	1	Joint Land Use Study (JLUS)	% of JLUS recommendations implemented; 0 for no JLUS and a % for extent completed	Percentage of JLUS recommendations implemented	Percent value x 100	Environmental Division - Base Planner - Base Public Affairs

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.4	Encroachment threats, joint land use planning, and action plan	Relationship with local/regional zoning authority	1	Number of meetings, communications between NBVC and local authorities (more is better, avoid decrease in number);	GRI Indicator SO1	Ratio of # of actual/planned meetings w/ local authorities	Percent value x 100	Environmental Division - Base Planner
3.1	Overall status and quality of key off-base community relationships	Community economic impact of NBVC	1	Direct economic benefits brought to the community due to the NBVC's operation (number of jobs created, payroll to employees, taxes to government, etc.)	GRI Indicator SO1	Dollars, # of jobs compared to goal or historical high	Percent value x 100	Budget Office
3.1	Overall status and quality of key off-base community relationships	Community perception of NBVC	1	Survey of public perception of NBVC activities/operations	GRI Indicator SO1	Number of complaints	Goal is 0 complaints (index =100); historical max number (index= 0)	Environmental Division - Base Planner or Community Survey
3.1	Overall status and quality of key off-base community relationships	Direct economic impact on local & regional community	1	Total NBVC expenditure of funds in community	GRI Indicator SO1	Dollars, # of jobs compared to target or historical high	Percent value x 100	Budget Office

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.1	Overall status and quality of key off-base community relationships	Local / Regional Regulatory Issues	1	Number of restrictions on operations as result of local/regional regulatory issues	JLUS	Number of restrictions	Goal is 0 (index =100); historical max number (index= 0)	Environmental Division - Base Planner
3.3	Community transportation issues	Presence / utilization of bicycle lanes /paths	2	Presence/utilization of bicycle lanes/paths; miles of bike lanes/paths or percentage of roads with bike lanes (goal is 100%)	LEED-ND	Percentage of roads w/ bike lanes or bike paths that lead to NBVC	0-100; with goal being 80-100	http://www.governtura.org/?q=get-there-by-bike/bike-map/oxnard
3.4	Encroachment threats, joint land use planning, and action plan	Local population	2	Local population growth rates/projections	Measure of ability for region to accommodate population growth	Regional Population growth rate	TBD	County/State data
3.4	Encroachment threats, joint land use planning, and action plan	NBVC interface with local zoning	2	Level of interaction with local zoning commission; number of meetings between base/Zoning Commission	JLUS	Ratio of actual meetings compared to goal	Ratio x 100	Environmental Division - Base Planner - Base Public Affairs

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.4	Encroachment threats, joint land use planning, and action plan	Protected operating zones outside NBVC	2	Percent of land/flight paths/operating areas that are protected by local/state zoning regulations	JLUS	Percent of flight paths/op areas protected	Percent value x 100	Environmental Division - Base Planner
3.1	Overall status and quality of key off-base community relationships	NBVC/community participation	2	Number of local and regional projects and Community Service events participated in and number of NBVC personnel volunteering	GRI Indicator SO1	Number of events compared to goal	Ratio x 100	NBVC Public Affairs Office (PAO)
3.1	Overall status and quality of key off-base community relationships	NBVC/community participation	2	Number of business partnerships and/or initiatives to seek services/supplies from local business/producers	GRI Indicator SO1	Number of events compared to goal	Ratio x 100	NBVC Public Affairs Office (PAO)
3.1	Overall status and quality of key off-base community relationships	NBVC/community participation	3	Number of public speaking engagements by NBVC officials, community engagement and dialogues	GRI Indicator SO1	Number of events compared to goal	Ratio x 100	NBVC Public Affairs Office (PAO)

3.0 NEIGHBORS AND STAKEHOLDERS (NS)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
3.1	Overall status and quality of key off-base community relationships	NBVC/community participation	3	Number of public participants in NBVC 'Open House' events, community engagement and dialogues	GRI Indicator SO1	Number of events compared to goal	Ratio x 100	NBVC Public Affairs Office (PAO)

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.2	Buildings and grounds O&M	Building maintenance cost	1	Annual maintenance per Single Platform, \$/Sq Ft. Maximo (SPM) / SF by building type	Annual maintenance per Single Platform Maximo (SPM) / SF by building type	Actual maintenance cost vs. target maintenance costs	Scale to goals	SPM
4.2	Buildings and grounds O&M	Facilities condition index (FCI)	1	FCI from DRRS or SPM	FCI	Index value between 0-100	0-100 scale from DRRS	DRRS-N or SPM
4.2	Buildings and grounds O&M	Maintenance backlog	1	SPM	Maintenance requests unfilled after 90 days	% of requests filled after 90 days	Percent value x 100 or scale to goals	SPM
4.2	Buildings and grounds O&M	Facilities performance condition	1	% of Facilities FCI of 80 or above	(FCI from Installation Condition Index Program (ICAP) * Number of facilities from iNFADS) / Number of buildings	Index value between 0-100	Index value between 0-100	SPM Facility Condition Assessment Process (Note 1)

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.2	Buildings and grounds O&M	Sustainability retrofit status	1	Federal Real Property Profile (FRPP) database managed by the Federal Real Property Council (FRPC)	LEED for Existing Buildings (EB)	% of existing buildings meeting sustainability guidelines	Percent value x100	FRPP
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, cost	Organic (natural) water source capacity	1	Base water usage from organic sources, total base water usage	GRI Indicator EN8; Dependent upon availability, cost and goals for on-base supplies	Percent of water needs met by on-base sources	Scaled to goals for water supply sources	Base utilities
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, cost	Water conservation implementation	1	Inventory of facilities with water conservation and/or water capture designs	LEED-EB	Reductions in volume of water used	Scale to goals for	Base utilities
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, cost	Surface and ground water status	1	Measurement and change in items over time (trend in local surface water /water table levels/salt water intrusion)	GRI Indicator EN8	Quantity of ground and surface water available to base	Scale to goals for volume of water available	Environmental Division

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, cost	Regional water availability	1	Measurement of changes in regional water supply and demand over 10 year periods	GRI Indicator EN8	Quantity of ground and surface water available to region	Scale to goals for volume of water required for region	Regional utility data
4.4	Domestic freshwater quality, quantity, availability, reliability, efficiency, cost	Water consumption	1	Base utility records of water use, base occupancy records	GRI Indicator EN8	Ratio of installation water use per capita to average or goal for per capita us	Ratio x 100	Base utility records; base occupancy records
4.3	Energy availability, reliability, efficiency, and cost	On-base critical power capacity	1	Total generation capacity/total critical load	Critical load requirements	Total on-base generation capacity/total critical load	Ratio x 100	Base utilities
4.3	Energy availability, reliability, efficiency, and cost	Base electrical generation cost	1	Cost per kwh of on-base generation capacity	Compare actual on-base cost to target cost per Kwh	Cost per Kwh of on-base/off-base cost	Ratio x 100	Base utilities
4.3	Energy availability, reliability, efficiency, cost	Base energy density or intensity	1	Energy usage per sq/ft per (energy density) by type	Compare to target intensity by building type	Actual vs. target energy intensity	Scale to goal for energy intensity	Base utilities

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.3	Energy availability, reliability, efficiency, and cost	Facility power reliability	1	Mean time between failure/repair time in facilities	Minimize time between on-base power failure	Actual vs. goal for time between failure	Scale to goals	Base utilities
4.3	Energy availability, reliability, efficiency, and cost	Power grid reliability	1	Mean time between failure and mean time to repair for both on base grid and supply grid	Minimize time between grid and on-base power failure	Actual vs. goal for time between failure	Scale to goals	Base utilities
4.3	Energy availability, reliability, efficiency, and cost	Renewable energy	1	% of total energy use that is from renewable sources	Set target renewable energy standard	Actual vs. target percentage renewable energy	Scale to goals	Base utilities
4.9	Solid waste recycling/disposal – landfill	Waste to energy conversion	1	% of base waste converted to produce energy + production of methane from base landfills	Set target for energy to waste potential	Actual vs. target waste to energy conversion	Scale to goals	Base records
4.9	Solid waste recycling/disposal – landfill	Cost to use public landfill	1	Contract costs	GRI Indicator EN22. For waste that must be landfilled, set target cost	Actual vs. target costs	Scale to goals	Contractor records

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.9	Solid waste recycling/disposal – landfill	Landfill capacity	1	Base or contractor records for off-base disposal capacity	GRI Indicator EN22	Actual vs. target costs	Scale to goals	Contractor records
4.9	Solid waste recycling/disposal – landfill	Mass of material sent to landfill	1	Base records for off-base disposal	GRI Indicator EN22	Actual vs. target mass	Scaled to goal	Base records
4.9	Solid waste recycling/disposal – landfill	Solid waste diversion rate	1	Base records for on-base diversion/recycling	GRI Indicator EN22	Actual vs. target diversion rate	Scaled to goal	Base records
4.5	Wastewater treatment availability and cost	On-base wastewater treatment capacity	1	Base utility data on amount of wastewater treated on base	See conceptual metrics for Issue/Element 5.5	Actual quantity of wastewater treated vs. goal	Scaled to goal	Base utility records
4.5	Wastewater treatment availability and cost	Wastewater volume	1	Wastewater volume per capita by source	See conceptual metrics for Issue/Element 5.5	Actual vs. target wastewater volume	Scaled to goal	Base utility records, Base occupancy records
4.5	Wastewater treatment availability and cost	On-base water reclamation and reuse	1	Base utility data	See conceptual metrics for Issue/Element 5.5	% or on-base water reclaimed for reuse	Scaled to goal	Base utility records

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.8	Landscaping design and efficiency	Landscape maintenance costs	1	SPM/Public Works records	Maximize efficiency/design to minimize maintenance costs	Actual vs. target costs	Scaled to goal	Contractor records
4.2	Buildings and grounds O&M	Cost of landscaping/maintenance	2	SPM/Public Works records	Actual vs. target landscaping costs	Actual vs. target costs	Scaled to goal	SPM
4.2	Buildings and grounds O&M	Percentage of buildings over 50 years old	2	Federal Real Property Profile (FRPP) database	TBD	TBD	TBD	iNFADS or FRPP
4.8	Landscaping design and efficiency	Percent of landscaping waste composted	2	Inventory of landscaping waste generated and composted	Set goal for composting rate e.g., 95%	Actual vs. target composting rate	Scale to goal	Contractor records
4.8	Landscaping design and efficiency	Quantities of pesticides, herbicides, and artificial fertilizer used per year	2	Inventory of quantities purchased and used	Set target for reduction in use	Actual vs. target quantities used/applied	Scale to goal	Contractor records
4.5	Wastewater treatment availability and cost	Percent of facilities with wastewater reduction designs	2	Inventory of facilities with wastewater reduction designs	Set target for % of facilities	% of facilities with vs. goal	Scale to goal	Base utilities

4.0 OPERATION AND MAINTENANCE (OM)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0-100 Scaling	Data POC/Source
4.3	Energy availability, reliability, efficiency, and cost	Capability to 'island' during a grid failure	2	% of energy required by base generated with on base resources or available through emergency systems	% of energy required by base generated with on base resources	% of energy required	Scale to goal	Base utilities
4.8	Landscaping design and efficiency	Percent of landscaping with native species	3	% of base area landscaped with native species	Set goal for percentage area	% of area with native species landscaping	Scale to goal	Contractor records

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.3	Air quality/ greenhouse gas (GHG)	Non-CO2 greenhouse gases on base	1	Non-CO2 GHG (Methane, SF6, HFCs, PFCs, N2O, etc) Could convert to equivalent CO2 units	Annual emissions estimates based on operations	Tons of non-CO2 GHG emitted per unit time or per capita per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division
5.3	Air quality/ greenhouse gas	CO2 emissions from power and heating on base	1	Direct emissions: emissions from combustion of oil, coal, natural gas/propane for electricity, heat, steam on the installation. (Fuel oil, coal, natural gas, diesel fuel bills)	World Business Council on Sustainable Development (WBCSD) or other GHG Protocol	Tons of CO2 emitted per unit time, or per capita per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division
5.3	Air quality/ greenhouse gas	CO2 emissions from transportation on base	1	Direct Emissions: emissions from combustion of transportation fuels from on-base sources (gasoline, diesel fuel, jet fuel bills)	WBCSD GHG Protocol	Tons of CO2 emitted per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.3	Air quality/ greenhouse gas	CO2 emissions industrial and munitions on base	1	Direct emissions from venting and fugitive emissions (e.g., industrial emissions, munitions use)	WRI/WBCSD GHG Protocol	Tons of CO2 emitted per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division
5.3	Air quality/ greenhouse gas	CO2 emissions power and heat off-base utilities	1	Indirect emissions: emissions from combustion of oil, coal, natural gas/propane for electricity, heat, steam, incineration purchased from off-base sources.	WRI/WBCSD GHG Protocol	Tons of CO2 emitted per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division; Base Utilities
5.3	Air quality/ greenhouse gas	CO2 emissions transportation off-base	1	Indirect emissions: emissions from combustion of transportation fuels by people entering the base (estimates or surveys of fuel used for commuting, delivery of materials, etc.)	WRI/WBCSD GHG Protocol/ Annual Survey	Tons of CO2 emitted per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.3	Air quality/ greenhouse gas	Air pollution non-attainment days	1	Number of non-attainment days	Number of non-attainment days should approach zero	Number of non-attainment days per year	Scaled to goal for number of non-attainment days	Environmental Division
5.3	Air quality/ greenhouse gas	Permitted emissions	1	Total amount of emissions permitted	Actual emissions compared to goal	Mass per year	Scaled to goals for each compound or emission type	Environmental Division
5.3	Air quality/ greenhouse gas	Toxic emissions to air, water, land	1	TRI emissions reported	Actual emissions compared to emissions goal	Mass of material emitted per unit time	Scaled to goals for each compound or emission type	Environmental Division
5.4	Hazardous and solid waste streams onto and off of the base	Hazardous material usage	1	Amount of hazardous material used. Current is "0" or close to it; no use of hazmat is 100	Hazardous material pharmacy system, supply department	Mass of material used per unit time	Scaled to goals for hazardous materials reduction	Environmental Division; Hazardous material system, supply dept

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.8	Natural Habitat/Threatened and Endangered Species	Habitat and species protection	1	% of projects/objectives achieved vs. those listed in current INRMP; adjust If INRMP is updated periodically	TES Recovery goals	% progress towards 5 year goals in INRMP	Scaled to habitat and species recovery goals	INRMP, Environmental Division
5.8	Natural Habitat / Threatened and Endangered Species	Endangered species population recovery	1	Annual population estimates and trends; percentage of target population, population viability analysis; base index on attaining population goals (= 100)	TES Recovery goals	Percentage of recovery population goal achieved	Scaled to species recovery goals	Environmental Division
5.5	Water/surface water	Water consumption	1	Water usage by type (residential, office, etc)	GRI Indicator EN8	Volume of water used per unit time per capita	Scale to total or per capita consumption goal	Base Utilities; Environmental Division
5.5	Water/surface water	Water consumed from off-base sources	1	Portion of water needs met by off base sources	GRI Indicator EN8; Dependent upon availability, cost and goals for off-base supplies	Percent of water needs met by off base sources	Scaled to goals for water supply sources	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.5	Water/surface water	Wastewater recycling and reuse	1	% of amount of recycled water vs discharged;	GRI Indicator EN12; Goal may be zero discharge of wastewater	% of wastewater recycled vs. discharged	Scaled to goal (e.g., 100% of goal = 100 0% = 0)	Environmental Division
5.5	Water/surface water	Wastewater flow	1	Waste discharged to streams; number, capacity, and currency of NPDES permits	GRI Indicator EN12;	Mass of material released	Scaled to goal (e.g., 100% of goal = 100 0% = 0)	Environmental Division
5.5	Water/surface water	Non-point source water pollution	1	Estimates of quantity of non-point source discharges to surface waters	GRI Indicator EN12;	Estimated mass of material released	Scaled to goal (e.g., 100% of goal = 100 0% = 0)	Environmental Division
5.5	Water/surface water	Surface water quality	1	Index of surface water quality parameters for receiving waters and waters entering and leaving the installation	GRI Indicator EN12; Index of the full suite of BOD, toxins, heavy metals (very robust), etc., or the most prevalent	Concentration or mass of water quality parameters	Scaled to goal (e.g., 100% of goal = 100 0% = 0)	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.5	Water/surface water	Regional watershed condition	1	Watershed quality: index of water quality parameters within the regional watershed, water flowing onto the installation, and water flowing off the installation related to changes in land use	Index of the full suite of BOD, toxins, heavy metals, etc., or index of the most prevalent	Concentration or mass of water quality parameters	Scaled to goal (e.g., 100% of goal = 100 0% = 0)	Environmental Division
5.3	Air quality/ greenhouse gas	CO2 Emissions reductions by usage type (residential, transportation, industrial, etc.)	2	Carbon emissions reductions from alternative energy use	WRI/WBCSD GHG Protocol	Tons of CO2 emitted per unit time or per capita per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division
5.3	Air quality/ greenhouse gas	CO2 Emissions reductions by usage type (residential, transportation, industrial, etc.)	2	Carbon emissions reductions from conservation measures	WRI/WBCSD GHG Protocol	Tons of CO2 emitted per unit time or per capita per unit time	Scaled to annual reduction goal; meeting the goal =100	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.4	Hazardous and solid waste streams onto and off of the base	Recycled Material Used	2	% recycled content in new material purchased; goal is 100% recycled content	GRI Indicator EN22	% recycled content in new material purchased	Scaled to goal, where 100 = goal	Supply Department/ Environmental Division
5.4	Hazardous and solid waste streams onto and off of the base	Solid waste management	2	Solid waste diversion rate/ amount of SW disposed -	GRI Indicator EN22; diversion of 100% may be goal	% of solid waste diverted	Scaled to goal	Environmental Division
5.4	Hazardous and solid waste streams onto and off of the base	Solid waste management	2	Annual solid waste disposal cost	GRI Indicator EN22	Annual cost in \$\$	Scaled to goal	Environmental Division
5.4	Hazardous and solid waste streams onto and off of the base	Solid waste management	2	Material recycled as a % of total solid waste	GRI Indicator EN22	% of recyclable solid waste that is recycled	Percent x 100 or scaled to goal for % recycled	Environmental Division
5.4	Hazardous and solid waste streams onto and off of the base	Solid waste management	2	Solid waste generation	GRI Indicator EN22	Actual mass of solid waste generated compared to goal	scaled to goal for solid waste generation	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.1	Impact of historical or "legacy" environmental issues	Status of legacy environmental cleanup sites	2	Number of legacy environmental sites, % of sites with RODs in place, annual expenditures, estimated cost to complete, number of closed NFA sites	GRI Indicator EN22	% of sites with NFA sites	Scaled to goal for legacy sites	Environmental Division
5.8	Natural habitat/threatened and endangered species	Extent of habitat for each listed species/species at risk and trend	2	% of actual Collective Area of habitat for each listed species/ species at risk vs collective area of habitat designated as critical habitat in acres, hectares or square miles; critical habitat might be given a factor of 80 with "optimal" being 100	GRI Indicator EN13	Areal extent of habitat for each species	Scaled to goal	INRMP, Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.8	Natural habitat/threatened and endangered species	Status of natural habitat and trend	2	Extent of each natural habitat type (uplands, wetlands, coastal, etc) in acres, hectares or sq miles; use Expert opinion to establish 0-100 scale	GRI Indicator EN13	Area of protected habitat	Scaled to goal	INRMP, Environmental Division
5.8	Natural habitat/threatened and endangered species	Status of natural habitat and trend	2	Index of habitat quality parameters for each type of habitat on the installation	Expert Opinion on quality of habitat and changes	Index TBD	Scaled to goal	INRMP, Environmental Division
5.8	Natural habitat/threatened and endangered species	Status of natural habitat and trend	2	Status of Wetland / Land Banks - acreage of current wetlands bank, changes over time. '80' means land in banks can meet the projected future needs	Section 404 mitigation banking	Areal extent of land/wetland banks	Scaled to goal	INRMP, Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.8	Natural habitat/threatened and endangered species	Status of natural habitat and trend	2	Areal extent of 'buffer zones', easements, and or contiguous habitat acquired off base; desired buffer zone = 100	JLUS	Percent of desired buffer lands acquired/in easements	Scaled to goal	INRMP, Environmental Division
5.8	Natural habitat/threatened and endangered species	Status of natural habitat and trend	2	Fragmentation index of habitat; index of changes in areal extent, patch size, existence and size of corridors between patches, etc.; expert opinion to establish 0-100 scale	TBD	TBD	TBD	INRMP, Environmental Division
5.5	Water/surface water	Storm water management	2	Storm water flows, % of storm water treated, number of overflow incidents, % of area as impermeable surface, % flow (or amount) captured for reuse	NPDES Permit	Volume of water, number of incidents, % impermeable surface, % storm water reuse	TBD	Environmental Division

5.0 ENVIRONMENT (EN)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metrics Model	Unit of Measure	0 - 100 Scaling	Data POC/Source
5.7	Air quality/ greenhouse gas	CO2 emissions reductions initiatives	3	Number of carbon emission reduction initiatives planned, completed, ongoing	Number of initiatives funded in the fiscal year	Ratio of actual/ planned # of initiatives	Ratio x 100	Environmental Division
5.3	Air quality/ greenhouse gas	Emissions of ozone depleting substances (ODS)	3	Total annual emissions of ODS and reduction efforts	GRI Indicator EN19	Ratio of actual/goal for mass of material emitted per unit time	Ratio x 100	Environmental Division, Supply Department, Aircraft Ops

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.8	Availability and quality of education opportunities	Local community school quality	1	Standard community school rating from State/U.S. data	percentile ranking nationally; closer to 100 is better or compared to local/regional goal	percentile ranking	Direct use of percentile or scaled to goal	Data are available at the districts and State level - CA data is at http://www.ed-data.k12.ca.us/welcome.asp
6.8	Availability and quality of education opportunities	School adequacy	1	Survey of NBVC families about adequacy of schools	TBD	Percentage satisfied	Scaled to goal for % satisfaction	Annual Survey
6.8	Availability and quality of education opportunities	Travel to schools	1	Travel time or distance to schools	TBD	Ratio of actual vs. target or average time	Scaled to goal	Annual Survey
6.2	Availability of affordable, adequate housing on- and off-base	Off-base housing accessibility	1	Average distance to NBVC	Average distance to affordable/adequate off base housing	Real estate data - miles	Scaled to goal	Annual Survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.2	Availability of affordable, adequate housing on- and off-base	Off-base housing affordability index	1	Analysis of housing prices and wages compared to 30% of income or index of median rent versus median VHA or median mortgage cost; house price versus median VHA; Locality pay at OPM	Average/median variable housing allowance (VHA) for military and locality pay for civilians	Inverse index of above or below average nationwide;	Scaled to goal	Office of Personnel Management website; VHA rates at http://perdiem.hqda.pentagon.mil/perdiem/bah.htm !
6.2	Availability of affordable, adequate housing on- and off-base	Off-base housing satisfaction	1	Satisfaction with off-base housing survey	TBD	% satisfied	Percent x100	Annual survey
6.2	Availability of affordable, adequate housing on- and off-base	Off-base housing sufficiency	1	Off-base housing vacancy rate data	TBD	% of housing vacant - real estate data	TBD	County or regional real estate data
6.2	Availability of affordable, adequate housing on- and off-base	On-base housing accessibility	1	Average distance to job location, time to get to job location, survey	Average housing to office travel	Actual miles/time compared to goal	Scaled to goal	Annual survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.2	Availability of affordable, adequate housing on- and off-base	On-base housing availability	1	Family waiting list for base housing; length of time on waiting list	TBD	% of families waiting vs total # of base units	Scaled to goal	Base Housing waiting list
6.2	Availability of affordable, adequate housing on- and off-base	On-base housing satisfaction	1	Satisfaction with base housing; survey	TBD	% satisfied	Scaled to goal	Annual survey
6.6	Quality, availability and accessibility of health care	Health care responsiveness	1	Waiting times for appointments	TBD	Days to see primary care physician, days to see specialists	Scaled to goal	Annual survey
6.6	Quality, availability and accessibility of health care	Health care satisfaction	1	Satisfaction of NBVC personnel WRT availability, quality, responsiveness of health care services on/off-base; time/distance to nearest hospital	TBD	Percentage satisfied	Scaled to goal	Annual survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.6	Quality, availability and accessibility of health care	Public transportation to health care facilities	1	Public transportation availability to health care	TBD	% of arrivals via other than private car	Scaled to goal	Annual survey
6.6	Quality, availability and accessibility of health care	Travel to health care facilities	1	Travel time/ distance to specialized facilities (MRI, etc)	TBD	Actual vs. target time	Scaled to goal	Annual survey
6.5	Quality, availability, and accessibility of child care	Child care accessibility	1	Travel time or distance to child care	TBD	Actual vs. target time	Scaled to goal	Annual survey
6.5	Quality, availability, and accessibility of child care	Child care satisfaction	1	Survey of NBVC families regarding child care availability, cost, accessibility	TBD	Percentage satisfied	Scaled to goal	Annual departure survey
6.5	Quality, availability, and accessibility of child care	Quality, availability, and accessibility of child care	1	Public transportation availability to child care	TBD	% of arrivals via means other than private car vs by private vehicles; survey	Scaled to goal	Annual survey
6.8	Availability and quality of education	Availability and quality of education	2	Survey of NBVC families about adequacy of	TBD	Percentage satisfied	Scaled to goal	Annual survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
	opportunities	opportunities for adults		colleges/schools/training courses				
6.8	Availability/quality of education opportunities	Availability/quality of adult education opportunities	2	Travel time or distance to schools	TBD	Inverse scale; 0 is goal	Scaled to goal	Annual survey
6.7	Employment (civilian/spousal)	Off-base employment	2	% area population vs base population	TBD	% area population vs. base population	Scaled to goal	Census data
6.7	Employment (civilian/spousal)	Off-base employment	2	Area unemployment rate	TBD	Area unemployment rate - inverse scale	Scaled to goal	County data
6.7	Employment (civilian/spousal)	Off-base employment	2	Travel time or distance to spouse employment	TBD	Inverse scale; 0 is goal	Scaled to goal	Annual survey
6.7	Employment (civilian/spousal)	Off-base employment	2	Public transportation availability to employment	TBD	% of arrivals via means other than private car vs. by private vehicles	Scaled to goal	Annual survey
6.7	Employment (civilian/spousal)	On-base employment	2	% of base jobs filled by spouses	TBD	% of base jobs filled by spouses	Scaled to goal	Base Employment Office

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.7	Employment (civilian/spousal)	On-base employment	2	Base civilian job vacancy rate	TBD	Base civilian job vacancy rate	Scaled to goal	Base Employment Office
6.7	Employment (civilian/spousal)	On-base employment	2	% of base civilian workforce living within X miles	TBD	% of base civilian workforce living w/i X miles	Scaled to goal	Base Employment Office
6.7	Employment (civilian/spousal)	On-base employment	2	Travel time or distance to spouse employment	TBD	Inverse scale; 0 is goal	Scaled to goal	Annual survey
6.7	Employment (civilian/spousal)	On-base employment	2	Public transportation availability to employment	TBD	% of arrivals via means other than private car vs. by private vehicles	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Chaplain services, religious facilities	2	Satisfaction with services/facilities	TBD	% satisfied	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Chaplain services, religious facilities	2	Accessibility - Average distance to facilities	TBD	Housing office data - miles	Scaled to goal	Annual survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.3	Morale, Welfare, and Recreation Program and Facilities	Convenience stores (fast food/sundries)	2	Satisfaction with available/local facilities	TBD	% satisfied	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Convenience stores (fast food/sundries)	2	Accessibility – Distance to or hours of operation	TBD	% of 24 hour day open; avg distance/time	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program/Facilities	Convenience stores (fast food/sundries)	2	Availability via public transportation	TBD	% of public transit vs. private cars	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Convenience Stores (fast food/sundries)	2	Affordability - Price Differential between on and off-base stores	TBD	Ave % savings of commissary/exchange vs. off base markets;	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Recreation (gym, theater, bowling alley, pool, tennis, etc.	2	Survey of quality/satisfaction with available/local facilities	TBD	% satisfied	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Recreation (gym, theater, bowling alley, pool, tennis, etc.	2	Accessibility - % of % of capacity usage	TBD	% satisfied	Scaled to goal	Distance/open hours

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.3	Morale, Welfare, and Recreation Program and Facilities	Recreation (gym, theater, bowling alley, pool, tennis, etc.	2	Affordability - Price differential between on- and off-base amenities	TBD	Avg % savings of on-base vs. off base facilities;	Scaled to goal	County or regional real estate data
6.3	Morale, Welfare, and Recreation Program and Facilities	Recreation (gym, theater, bowling alley, pool, tennis, etc.	2	Recreation access by other than private vehicles (e.g., bus, cabs, light rail, bicycle, walk)	LEED-ND	% of arrivals via means other than private vehicles	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program/Facilities	Shopping (clothes, food, goods)	2	Survey of satisfaction with available facilities	TBD	% satisfied	Scaled to goal	Annual survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Shopping (clothes, food, goods)	2	Store accessibility - hours of operation	LEED-ND	% of 24 hours in operation; distance/time	Scaled to goal	Annual Survey
6.3	Morale, Welfare, and Recreation Program and Facilities	Shopping (clothes, food, goods)	2	Store accessibility via public transportation	LEED-ND	% of stores accessible by other than private vehicles	Scaled to goal	Annual survey

6.0 QUALITY OF LIFE (QL)								
	Issue/Element	Conceptual Metric	Tier	Suggested Data	Metric Model	Unit of Measure	0-100 Scaling	Data POC/Source
6.3	Morale, Welfare, and Recreation Program and Facilities	Shopping (clothes, food, goods)	2	Affordability - Price differential between PX and Commissary, and off-base stores	TBD	Ave % savings of commissary/exchange vs. off base markets	Scaled to goal	Annual survey